EFFECT OF SEED-COTTON MOISTURE LEVEL AT HARVEST ON GINNED LINT

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EFFECT OF SEED-COTTON MOISTURE LEVEL AT HARVEST ON GINNED LINT

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SUMMARY

Seed-cotton moisture level at harvest affects processing performance, fiber and seed quality, and monetary returns to the producer. Cottons harvested at different moisture levels were studied over three seasons to determine the extent of these effects.

All cottons were harvested with a spindle picker at moisture levels selected to approximate 8.5, 10.5, 12.5, and 14.5 percent. Actual moisture averaged 8.5, 11.8, 14.2, and 18.3 percent, with a range of 6.2–24.7 percent.

In the first season, all lots were processed through the conditioning system with ambient air. In the two following seasons, half the lots were processed with ambient air and half with air heated as necessary to reduce feeder-apron moisture to 6–8 percent. Half the lots got one stage and half got two stages of saw-cylinder lint cleaning.

The cleaning and conditioning systems handled all the cottons with no difficulty. Cottons with a high of 19.4 percent moisture at the feeder apron presented no difficulty when ginned within 8 hours of harvest, but were difficult to gin after standing overnight in the yard. High seed-cotton moistures reduced cleaning system efficiency.

All quality characteristics except 2.5-percent span length were higher in the cottons that were drier at harvest. Drying cotton with heated air tended to reduce lint turnout, but improved other quality characteristics, including seed viability.

INTRODUCTION

Tests have shown that, for some cottons, ginning quality can be improved by adding moisture before the cotton reaches the fiber-seed separation process.[1] Other tests have shown that high-moisture cottons should be processed immediately after harvest, because any delay in ginning (8 to 72 hours) will result in grade reductions, primarily from loss of color.[2]

Excessive moisture in cotton increases ginning costs. Greater quantities of fuel are required to reduce the moisture content to optimum levels for processing. Production rates are adversely affected, decreasing gin plant efficiency and increasing unit processing costs. Reduced production rates tie up trailers on the gin yard for longer periods of time. The slow turnaround time at the gin can seriously affect the harvesting schedule and efficient utilization of trailers.

Although harvesting recommendations emphasize the importance of picking only when cotton is thoroughly dry, the moisture content of seed cotton delivered to the gin varies considerably. The ginner must be capable of selecting those processing machines and techniques which will preserve fiber quality and maximize producer profits. The major objective of this study was to determine the effect of seed-cotton moisture levels on processing performance, fiber and seed quality, and monetary returns to the producer.

PROCEDURE

Source of Cotton

Test cottons were grown by the Clemson University Farms Department in Anderson County, S.C., on predominantly Cecil sandy loam soils, using cultural and harvesting practices generally recommended for this area. Varieties used were 'Coker 413', 'Coker 417', and 'Coker 201' in successive seasons.

[1] Moore, Vernon P., and Griffin, Clyde, Jr. 1964. The relationship of moisture to cotton quality preservation at gins. U.S. Dep. Agric., Agric. Res. Serv. [Rep.] ARS 42-105, 12 pp.

[2] Montgomery, R. A., and Wooten, O. B. 1958. Lint quality and moisture relationships in cotton through harvesting and ginning. U.S. Dep. Agric., Agric. Res. Serv. [Rep.] ARS 42-14, 19 pp.

Harvesting

All cottons were harvested with a spindle picker at projected seed-cotton moisture levels of 8.5, 10.5, 12.5, and 14.5 percent, from fields that had not been harvested previously. All desired seed-cotton moisture levels were harvested on three dates, each date serving as a replication.

Ginning

Gin processing was performed at the Southeastern Cotton Ginning Research Laboratory with a high-capacity gin stand and standard gin machinery. Ginning proceeded immediately after cotton was delivered to the gin. All cottons, except those harvested at the lowest moisture level, were ginned within 8 hours after harvest. Some of the cottons harvested at the lowest moisture level were stored overnight before ginning.

In the first season, all lots were processed with ambient air. In the two succeeding seasons, half of the lots were processed with ambient air, and the other half at temperatures that would result in fiber moisture contents of 6 to 8 percent at the feeder apron.

The machinery sequence in the conditioning and seed-cotton cleaning system for all three seasons was (1) suction telescope, (2) separator, (3) automatic feed control, (4) 24-shelf tower dryer, (5) 7-cylinder inclined cleaner, (6) stick and green leaf machine, (7) separator, and (8) distributor.

Lint from each seed-cotton moisture treatment was processed through one or two saw-cylinder lint cleaners. In the first season, this yielded eight combinations of variables which could be compared to show differences among the four seed-cotton moisture levels and between the two levels of lint cleaning. In following seasons, there were 16 combinations of variables which could be compared to show differences among the four seed-cotton moisture levels; between ambient air and heated air in the conditioning system; and between the two levels of lint cleaning.

The seed-cotton input control and the feed rolls in the extractor-feeder were adjusted for a continuous processing rate of four bales per hour for all test lots.

Seed cotton was unloaded through the wagon suction telescope and separator and deposited in a weighing hopper. A minimum of 700 pounds was accumulated on the floor below the hopper (enough for one-half bale lots), then picked up by the suction telescope inside the gin plant for reintroduction into the conditioning and seed-cotton cleaning systems.

Original lot weights, seed weights, and lint weights were recorded. Portable hygrothermographs recorded temperature and relative humidity inside the gin. Temperature was measured at a point 2 feet ahead of the hot air-seed cotton mix point. Elapsed time for the conditioning, cleaning, and ginning phases was recorded. Samples of seed cotton, seed, and lint were obtained at various processing stages for evaluation of moisture, processing performance, and quality.

Fiber Tests

Samples were obtained before lint cleaning for lint foreign-matter content and fiber testing, and after lint cleaning for foreign-matter content, classification, and fiber testing. Ginned lint was tested for fiber length, strength, and fineness by the fibrograph, Pressley, and micronaire tests, respectively. Lint foreign-matter content was determined by the Shirley analyzer and color by the colorimeter.

RESULTS

Statistical Treatment

Variables for the second and third seasons were four seed-cotton moisture levels, two conditioning levels, and two lint-cleaning levels, with three replications. Comparisons of the three test variables and test items were made through an analysis of variance for a split-split plot design combined over years. The main plot factor was seed-cotton moisture. Subplots were the two conditioning levels, and sub-subplots were the two lint-cleaning levels.

Variables for all cottons conditioned with ambient air were four seed-cotton moisture levels and two lint-cleaning levels. Comparisons of the two test variables and test items were made through an analysis of variance for a split-plot design combined over years. The main plot factor was seed-cotton moisture. Subplots were the two lint-cleaning levels.

Seed Cotton

Moisture content of wagon samples exceeded projections at all levels except the lowest; however, significant differences were achieved among levels (table 1). The four moisture levels

averaged 18.2, 14.2, 11.8, and 8.5 percent. These levels are referred to in this report as level 1 (or high), 2, 3, and 4 (or low), respectively. Significant differences were also achieved among moisture levels by test treatments combined over harvest seasons, but there were no differences between conditioning level and lint-cleaning level (table 2).

Trash content of all wagon samples ranged from 2.5 to 9.8 percent and averaged 4.5 percent (table 3). Though not significant, a decrease in trash content as seed-cotton moisture content decreased was indicated (table 4). Seed cotton moisture affected the amounts of several trash elements. Bur, stick, and large-leaf content decreased and small-leaf content increased as seed cotton moisture content increased (tables 5 and 6).

TABLE 1.—*Moisture content of seed cotton from wagon samples, in percent*

Moisture level	Projected moisture	Actual moisture	
		Range	Average[1]
1 (high)	14.5	11.1–24.7	18.2a
2	12.5	12.6–20.4	14.2b
3	10.5	8.4–15.5	11.8c
4 (low)	8.5	6.3–12.6	8.5d

[1] Means not having a letter in common are significantly different at the 1% level.

TABLE 2.—*Moisture in seed cotton at wagon, by moisture level, in percent*

Moisture level	2d and 3d seasons[1]	3 seasons[1 2]
1 (high)	18.3a	18.5a
2	13.7b	14.3b
3	12.0b	11.8c
4 (low)	8.4c	8.5d

[1] Means not having a letter in common are significantly different at the 1% level.

[2] Cotton lots to be conditioned with ambient air only.

TABLE 3.—*Trash elements in seed cotton at wagon, in percent*

Trash element	Range[1]	Average
Burs	0.3–2.6	1.3
Sticks	.1–1.2	.5
Grass	0 –4.1	.3
Large-leaf	0 –2.0	.7
Small-leaf	.6–1.6	.9
Total[1]	.3–2.4	.8
Total[1]	2.5–9.8	4.5

[1] Total in range column is not sum of entries.

TABLE 4.—*Trash in seed cotton at wagon, by moisture level, in percent*

Moisture level	2d and 3d seasons	3 seasons[1]
1 (high)	4.5	4.9
2	4.6	4.5
3	4.4	4.4
4 (low)	4.1	4.2

[1] Cotton lots to be conditioned with ambient air only.

Seed-Cotton Processing

The processing rate through the seed-cotton conditioning and cleaning systems for moisture level 1 was higher than for all other moisture levels, although feed-roll speed was constant throughout the study (table 7). The difference is assumed to have resulted primarily from the greater density of seed cotton at the high moisture level.

Moisture removed during conditioning and cleaning was proportional to original moisture content regardless of conditioning air level used, but was greatest when conditioning air was heated (table 8). The effect of seed-cotton moisture level on subsequent moisture content of seed cotton, lint, and seed is summarized in tables 9 and 10.

TABLE 5.—*Trash elements in seed cotton at wagon, by moisture level, second and third seasons, in percent*

Moisture level	Burs[1]	Sticks[2]	Grass	Large-leaf[2]	Small-leaf[1]	Motes
1 (high)	1.3ab	0.6a	0.4	1.0a	0.7a	0.6
2	1.5a	.5b	.3	.6b	.7a	1.0
3	1.4a	.5b	.2	.5b	1.1b	.7
4 (low)	1.0b	.4b	.3	.5b	1.0b	.9

[1] Means not having a letter in common are significantly different at the 1% level.

[2] Means not having a letter in common are significantly different at the 5% level.

TABLE 6.—*Trash elements in seed cotton at wagon, by moisture level, three seasons, in percent*[1]

Moisture level	Burs[2]	Sticks[2]	Grass	Large-leaf[2]	Small-leaf[2]	Motes
1 (high)	1.3a	0.6a	0.6	1.0a	0.7a	0.7
2	1.4a	.4b	.3	.7b	.8a	1.0
3	1.3a	.4b	.2	.6b	1.0b	.8
4 (low)	1.0b	.3b	.4	.5b	1.0b	1.0

[1] Cotton lots to be conditioned with ambient air only.

[2] Means not having a letter in common are significantly different at the 5% level.

TABLE 7.—*Effect of moisture level on seed-cotton processing rate, in bales per hour*

Moisture level at wagon	2d and 3d seasons			
	Ambient air[1]	Heated air[1]	Combined conditioning treatments[1]	3 seasons (ambient air only)[1]
1 (high)	4.5a	4.6a	4.6a	4.5a
2	4.1b	4.2b	4.1b	4.2b
3	4.0b	4.1b	4.0b	4.1b
4 (low)	3.9b	4.0b	4.0b	4.1b
Average	4.1	4.2	4.2	4.2

[1] Means not having a letter in common are significantly different at the 1% level.

TABLE 8.—*Effect of conditioning and cleaning systems on seed-cotton moisture content*

Moisture level at wagon	Percentage-point decrease in moisture content			
	2d and 3d seasons			3 seasons (ambient air only)
	Ambient air	Heated air	Combined conditioning treatments	
1 (high)	2.4	4.5	3.4	2.1
2	1.6	2.8	2.2	1.7
3	2.0	2.0	2.0	1.6
4 (low)	.3	.8	.6	.1
Average	1.6	2.5	2.1	1.4

The cleaning system was significantly less efficient when processing high-moisture cotton conditioned with either ambient or heated air (table 11). Efficiency was higher when heated air was used, and the effect of heated air was more pronounced on seed cotton of high initial moisture content. Cleaning efficiency ranged from 29.5 percent at the highest moisture level to 49.5 percent at the lowest moisture level for cottons conditioned with ambient air, and from 38.5 percent at the highest moisture level to 49.0 percent at the lowest moisture level for cottons conditioned with heated air. At the two lowest moisture levels, there was little or no difference in cleaning system efficiency between cottons conditioned with ambient or heated air. No difficulties were encountered in processing seed cotton through the conditioning and cleaning systems with seed-cotton moisture levels as high as 24.7 percent.

Ginning

The ginning rate increased as the seed-cotton moisture level decreased, ranging from 3.4 to 4.2 bales per hour for combined conditioning treatments in the two later seasons, and from 3.6 to 4.3 bales per hour for cottons conditioned with ambient air in the three seasons (table 12).

No difficulties were encountered in ginning cottons processed immediately after harvest (within 8 hours), although the moisture content of individual test lots at the feeder apron ranged

TABLE 9.—*Effect of test variables on moisture content of seed cotton, lint, and seed, second and third seasons*

Factor	Percent moisture in—				
	Seed cotton at wagon[1]	Seed cotton at feeder apron[1]	Lint before lint cleaning[1]	Lint at lint slide[1]	Seed at seed drop[1]
Moisture level:					
1 (high)	18.3a	14.9a	8.5a	7.1a	17.1a
2	13.7b	11.5b	6.3b	5.1b	13.9b
3	12.0b	10.0b	5.7d	4.5b	11.9b
4 (low)	8.4c	7.8c	5.2b	4.7b	9.0c
Conditioning level:					
1 (ambient air)	[2]13.2	11.6a	7.4a	6.0a	13.1
2 (heated air)	[2]13.0	10.5b	5.5b	4.7b	12.9
Lint cleaners:					
1	[2]13.0	[2]11.1	[2]6.6	5.7a	[2]13.1
2	[2]13.2	[2]11.0	[2]6.3	5.0b	[2]12.9

[1] Means not having a letter in common within a test variable are significantly different at the 1% level.

[2] Value not affected by test variable; given only to show moisture level of test lot before treatment.

TABLE 10.—*Effect of test variables on moisture content of seed cotton, lint, and seed conditioned with ambient air only, three seasons*

Factor	Percent moisture in —				
	Seed cotton at wagon[1]	Seed cotton at feeder apron[1]	Lint before lint cleaning[1]	Lint at lint slide[1]	Seed at seed drop[1]
Wagon moisture level:					
1 (high)	18.5a	16.4a	11.1a	8.2a	17.5a
2	14.3b	12.6b	8.0b	6.2b	14.0b
3	11.8c	10.2c	6.7bc	5.2b	11.9c
4 (low)	8.5d	8.4d	5.9c	5.1b	9.7d
Lint cleaners:					
1	[2]13.3	[2]11.9	[2]8.0	6.6a	[2]13.3
2	[2]13.2	[2]11.9	[2]7.8	5.7b	[2]13.2

[1] Means not having a letter in common within a test variable are significantly different at the 1% level.

[2] Value not affected by test variable; given only to show moisture level of test lot before treatment.

from 6.2 to 19.4 percent, moisture in ginned lint ranged from 3.3 to 17.3 percent, and moisture in seed at the seed drop ranged from 7.5 to 21.9 percent.

High-moisture seed cotton in excess of test requirements was stored overnight in the gin yard. On the following day it was necessary to recirculate the cotton through the conditioning system three times before it could be processed through the gin stand. Rough preparation was evident in lint samples from this cotton, but there was no evidence of rough preparation in lint samples from high-moisture cottons processed on the date of harvest.

For combined conditioning levels in the two later seasons, the ginned lint before cleaning showed increasing reflectance (R_d) as seed-cotton moisture level decreased. There were significant differences among degrees of yellowness ($+b$) and micronaire values at different moisture levels, but no clear trend could be discerned, as there were no differences between the extreme moisture levels (table 13). Though not signifi-

TABLE 11.—*Effect of moisture and conditioning levels on seed-cotton cleaning system efficiency*

Moisture level at wagon	Cleaning system efficiency, in percent			
	2d and 3d seasons		Combined conditioning treatments[2]	3 seasons (ambient air only)[1]
	Ambient air[1]	Heated air[2]		
1 (high)	29.5a	38.5a	34.0a	31.0a
2	41.9b	46.0b	44.0b	42.4b
3	45.2b	46.7b	48.8b	49.5b
4 (low)	48.6b	49.0b	48.8b	49.5b
Average[3]	41.3	45.1	43.2	42.1

[1] Means not having a letter in common are significantly different at the 1% level.
[2] Means not having a letter in common are significantly different at the 5% level.
[3] Average cleaning system efficiencies for cottons conditioned with ambient air and with heated air, 2d and 3d seasons, are significantly different at the 1% level.

TABLE 12.—*Effect of seed-cotton moisture and conditioning levels on ginning rate*

Moisture level at wagon	Ginning rate, in bales per hour			
	2d and 3d seasons			3 seasons (ambient air only)[2]
	Ambient air[1]	Heated air[1]	Combined conditioning treatments[1]	
1 (high)	3.4a	3.4a	3.4a	3.6a
2	3.8ab	3.8ab	3.8ab	3.9ab
3	3.9b	3.9b	3.9b	4.0ab
4 (low)	4.2b	4.2b	4.2d	4.3b
Average[3]	3.9	3.8	3.8	4.0

[1] Means not having a letter in common are significantly different at the 5% level.
[2] Means not having a letter in common are significantly different at the 1% level.
[3] Average ginning rates for cottons conditioned with ambient air and with heated air, 2d and 3d seasons, are significantly different at the 1% level.

cant, visible and total waste in lint decreased as moisture level decreased.

For all cottons conditioned with ambient air, the ginned lint showed a decrease in visible and total waste, a decrease in 2.5-percent span length, and an increase in R_d as the moisture level decreased. There were significant differences in $+b$ and micronaire values at different moisture levels, but again no clear trend was evident (table 14).

Seed

Seed viability increased significantly from 57.0 percent at the high moisture level to 79.5 percent at the low moisture level for combined conditioning levels in the later seasons (table 15). Similar results were obtained for all cottons conditioned with ambient air only.

Conditioning cottons with heated air increased seed germination significantly over conditioning with ambient air, but the greatest difference between the two conditioning treatments was obtained on cottons at the highest moisture level.

Lint Cleaning

Seed-cotton moisture level had no effect on lint-cleaning system efficiency when processing cottons conditioned with heated air, but, for cottons conditioned with ambient air, efficiency was significantly lower when processing the high moisture level cottons (table 16). There were no differences in cleaning system efficiency among the three lowest seed-cotton moisture levels.

Conditioning level had no overall effect on lint-cleaning system efficiency. As expected, cleaning efficiency increased significantly at all moisture and conditioning levels when the second stage of lint cleaning was added.

Lint cleaning reduced visible and total waste

TABLE 13.—*Effect of seed-cotton moisture level on fiber quality before and after lint cleaning, 2d and 3d seasons*

Test item	Seed-cotton moisture level				Level of significance,[1] %
	1 (high)	2	3	4 (low)	
Visible waste in lint:					
Before lint cleaning ....percent....	7.7	7.1	6.8	6.2	0
After lint cleaning ....do....	2.9a	2.3b	2.1b	1.9b	1
Total waste in lint:					
Before lint cleaning ....do....	9.0	8.6	8.3	7.5	0
After lint cleaning ....do....	4.0a	3.5ab	3.2b	3.0b	1
Degree of yellowness:					
Before lint cleaning ....+b....	8.2a	7.6b	7.7b	8.0ab	1
After lint cleaning ....+b....	8.7a	8.1b	8.2bc	8.5ac	5
Reflectance:					
Before lint cleaning ....R_d....	67.2a	68.3a	68.3a	72.3b	1
After lint cleaning ....R_d....	68.2a	71.3b	71.2b	75.0c	1
2.5-percent span length:					
Before lint cleaning ....inches....	1.16	1.15	1.15	1.15	0
After lint cleaning ....do....	1.16	1.15	1.14	1.13	0
Uniformity ratio:					
Before lint cleaning ....percent....	47	45	45	46	0
After lint cleaning ....do....	46a	44b	44b	45ab	1
Strength, ⅛-inch gage:					
Before lint cleaning ....grams per tex....	25.1	25.3	24.8	25.2	0
After lint cleaning ....do....	24.9	24.6	24.9	24.3	0
Micronaire reading:					
Before lint cleaning	4.4a	4.2b	4.2b	4.3a	5
After lint cleaning	4.3a	4.1b	4.1b	4.2ab	1

[1] Means not having a letter in common are significantly different at the indicated level.

TABLE 14.—*Effect of seed-cotton moisture level on fiber quality, before and after lint cleaning, of cotton treated with ambient air only*

Test item	Seed-cotton moisture level				Level of significance,[1] %
	1 (high)	2	3	4 (low)	
Visible waste in lint:					
Before lint cleaning ....percent....	9.8a	8.3ab	7.7b	6.9b	1
After lint cleaning ....do....	3.7a	2.6b	2.3b	2.0b	1
Total waste in lint:					
Before lint cleaning ....do....	11.2a	9.6ab	9.0b	8.0b	1
After lint cleaning ....do....	4.7a	3.7b	3.3b	3.0b	1
Degree of yellowness:					
Before lint cleaning ....+b....	8.1a	7.6b	7.7ab	7.9ab	1
After lint cleaning ....+b....	8.7a	8.1b	8.2ab	8.4ab	1
Reflectance:					
Before lint cleaning ....R_d....	66.6a	68.3b	68.4b	71.4c	1
After lint cleaning ....R_d....	68.9a	71.1b	71.4b	74.5c	1
2.5-percent span length:					
Before lint cleaning ....inches....	1.16a	1.15ab	1.15b	1.14b	1
After lint cleaning ....do....	1.15a	1.14ab	1.14ab	1.13b	1
Uniformity ratio:					
Before lint cleaning ....percent....	47	46	46	46	0
After lint cleaning ....do....	46a	45b	45b	45b	5
Strength, ⅛-inch gage:					
Before lint cleaning ....grams per tex....	24.6	24.7	24.3	24.4	0
After lint cleaning ....do....	24.5	24.1	24.3	23.9	0
Micronaire reading:					
Before lint cleaning	4.5ac	4.3b	4.4bc	4.5c	1
After lint cleaning	4.4a	4.3b	4.3bc	4.4ac	5

[1] Means not having a letter in common are significantly different at the indicated level.

TABLE 15.—*Effect of seed-cotton moisture and conditioning levels on seed germination*

Moisture level at wagon	Seed germination, in percent			
	2d and 3d seasons			3 seasons (ambient air only)[1]
	Ambient air	Heated air	Combined conditioning treatments[1]	
1 (high)	51.3	57.0	[1]54.1a	54.2a
2	65.8	65.7	65.8b	65.7ab
3	75.4	76.1	75.8b	77.9bc
4 (low)	78.5	79.5	79.0b	80.6c
Average[2]	67.8	69.6	68.7	69.6

[1] Means not having a letter in common are significantly different at the 1% level.

[2] Average seed germination of cottons conditioned with ambient air and with heated air, 2d and 3d seasons, are significantly different at the 1% level.

TABLE 16.—*Effect of moisture, conditioning levels, and lint cleaning levels on lint cleaning system efficiency*

Factor	Lint cleaning system efficiency, in percent			
	2d and 3d seasons			3 seasons (ambient air only)[1]
	Ambient air[1]	Heated air[1]	Combined conditioning treatments[1]	
Moisture level:				
1 (high)	52.3a	59.6	55.9	56.9a
2	58.8b	59.4	59.2	61.1b
3	61.4b	60.6	61.0	63.3b
4 (low)	60.4b	58.4	59.4	61.9b
Average	58.2	59.5	58.9	60.8
Lint cleaners:				
1	49.5a	52.7a	51.1a	52.9a
2	67.0b	66.4b	66.7b	68.7b

[1] Means not having a letter in common within a test variable are significantly different at the 1% level.

in lint, 2.5-percent span length, uniformity ratio, and fiber strength at ⅛-inch gage, and increased $+b$ and R_d for combined seed-cotton moisture and conditioning levels in the two later seasons (table 17). Visible and total waste in lint and uniformity ratio decreased and R_d increased as the seed-cotton moisture level decreased (table 11). There were differences among seed-cotton moisture levels in $+b$ and micronaire readings, but no differences between the extreme moisture levels. There were no differences among moisture levels for 2.5-percent span length and fiber strength at ⅛-inch gage after lint cleaning, but the trend indicated a decrease in span length as the moisture level decreased.

For all cottons conditioned with ambient air, lint cleaning reduced visible and total waste in lint, 2.5-percent span length, and uniformity ratio, and increased $+b$ and R_d for combined seed-cotton moisture levels (table 18). Lint cleaning had no effect on fiber strength or micronaire reading.

Visible and total waste in lint, 2.5-percent span length, and uniformity ratio decreased, and R_d increased as the seed-cotton moisture level decreased (table 12). There were differences among moisture levels in $+b$ and micronaire readings, but no trend could be established. There were no differences among moisture levels for fiber strength at ⅛-inch gage after lint cleaning.

Grade index increased as seed-cotton moisture level decreased (table 19). Grade index also increased when cottons were conditioned with heated air and two stages of lint cleaning were used.

TABLE 17.—*Effect of lint cleaning level on selected test items for combined seed-cotton moisture and conditioning levels, 2d and 3d seasons*

Test item	Number of lint cleaners			Level of significance,[1] %
	0	1	2	
Visible waste in lint .....percent....	7.0	3.0a	1.6b	1
Total waste in lint .....do.....	8.4	4.1a	2.7b	1
Degree of yellowness .....+*b*....	7.9	8.3a	8.5b	5
Reflectance .....R_d....69.0		71.2a	72.2b	1
2.5-percent span length .....inches....1.15		1.14a	1.13b	1
Uniformity ratio .....percent....	46	45a	44b	1
Strength, ⅛ inch gage ....grams per tex....25.1		24.8a	24.5b	1
Micronaire reading	4.3	4.2	4.2	0

[1] Level of significance refers only to differences between treatments using one or two lint cleaners. Values with no lint cleaners used are shown for comparison only.

TABLE 18.—*Effect of lint cleaning level on selected test items, for combined seed-cotton moisture levels conditioned with ambient air only, three seasons*

Test item	Number of lint cleaners			Level of significance,[1] %
	0	1	2	
Visible waste in lint .....percent....	8.2	3.4a	1.9b	1
Total waste in lint .....do.....	9.4	4.5a	2.9b	1
Degree of yellowness .....+*b*....	7.8	8.2a	8.4b	5
Reflectance .....R_d....68.7		71.0a	72.0b	1
2.5-percent span length .....inches....1.15		1.14a	1.13b	1
Uniformity ratio .....percent....	46	46a	45b	1
Strength, ⅛ inch gage .....grams per tex....24.5		24.3	24.1	0
Micronaire	4.4	4.3	4.3	0

[1] Level of significance refers only to differences between the treatments using one or two lint cleaners. Values with no lint cleaners used are shown for comparison only.

TABLE 19.—*Effect of test variables on selected test items, second and third seasons*

Factor	Test item				
	Grade index[1 2]	Staple length,[2] 1/32 of an inch	Lint turnout,[2 3] lb	Lint value[3]	
				CCC support price[2 4]	Spot market[2 5]
Moisture level:					
1 (high)	85.8a	35.3	482a	$93.05a	$121.42a
2	88.7b	35.1	496ab	102.14b	128.40b
3	90.9bc	35.1	506b	107.54b	132.98b
4 (low)	92.8c	34.9	532c	115.75c	141.07c
Conditioning level:					
1 (ambient air)	88.5a	35.3a	508a	103.90	131.33
2 (heated air)	90.6b	35.0b	501b	105.34	130.61
Lint cleaners:					
1	87.5a	[6]35.2a	511a	102.90a	131.20
2	91.6b	[6]35.9b	497b	106.35b	130.74

[1] Middling White (31) = 100. [2] Means not having a letter in common within a test variable are significantly different at the 1% level. [3] Per 1,500 lb seed cotton. [4] CCC support price, Pickens County, S.C. [5] October spot market price, Greenville, S.C. [6] Means not having a letter in common are significantly different at the 5% level.

Staple length was not significantly affected by these seed-cotton moisture levels, but the trend indicated a decrease in staple length as the moisture level decreased. Staple length decreased when cottons were conditioned with heated air and when lint was processed through two lint cleaners.

Lint turnout increased as seed-cotton moisture level decreased, ranging from 482 pounds per 1,500 pounds of seed cotton at the high moisture level to 532 pounds at the low moisture level. Lint turnout decreased when cottons were conditioned with heated air and when lint was processed through two lint cleaners.

Lint values increased as moisture level decreased, ranging from $93.05 at the high moisture level to $115.75 at the low moisture level based on Commodity Credit Corporation (CCC) support price for local area. Based on spot market prices, lint values ranged from $121.42 to $141.07 for high and low moisture levels, respectively.

Conditioning level had no effect on lint value. Based on the CCC support price, lint value was greater for lint processed through two lint cleaners than it was for lint processed through one lint cleaner. There was no difference between lint-cleaning levels when lint value was based on spot market prices.

Grade index, staple length, lint turnout, and lint value of all cottons conditioned with ambient air only followed the same trend as those for combined conditioning treatments in the two later seasons (table 20).

RECOMMENDATIONS

Cotton should not be harvested until it is thoroughly dry. Ginning costs increase when cotton contains excessive moisture. Production rates and processing performance of machinery are adversely affected. More fuel is required to reduce moisture content to an optimum level for processing.

Quality characteristics of cottons harvested with excessive moisture are less desirable than those of cottons harvested when thoroughly dry, even though removal of excess moisture at the gin generally improves quality characteristics.

Cottons containing excessive moisture should be ginned immediately after harvest. Delays of 8 hours or more usually result in grade reductions, primarily from loss of color. If much of the moisture is located on the surface of the fiber and the cotton is ginned immediately after harvest, gin processing will generally proceed with no major difficulty. If the cotton is held overnight, the seed may become soft and serious difficulties may be encountered during ginning.

The ginner should be notified when cottons containing excessive moisture are delivered to the gin. Ginning schedules can be changed to process these cottons immediately, utilizing machinery and techniques which will enhance processing performance and quality of fiber and seed.

TABLE 20.—*Effect of test variables on selected test items for cottons conditioned with ambient air only, three seasons*

Factor	Test item				
	Grade index[1] [2]	Staple length, 1/32 of an inch	Lint turnout,[2] [3] lb	Lint value[3]	
				CCC support price[2] [4]	Spot market[2] [5]
Moisture level:					
1 (high)	85.5a	35.4	473a	$90.61a	$112.92a
2	88.3ab	35.2	488ab	100.39b	120.42b
3	90.7bc	35.2	504bc	107.24b	126.71b
4 (low)	93.6c	34.9	520c	115.90c	134.24c
Average	89.5	35.2	496	103.54	123.58
Lint cleaners:					
1	87.6a	35.2	504a	101.58a	123.18
2	91.4b	35.1	488b	105.49b	123.97

[1] Middling White (31) = 100. [2] Means not having a letter in common within a test variable are significantly different at the 1% level. [3] Per 1,500 lb seed cotton. [4] CCC support price, Pickens County, S.C. [5] October spot market price, Greenville, S.C.